

PILOT ERRORS – A RESULT OF MISJUDGMENT

Eva Farkašová – Peter Čekan

The aim of the article is to introduce the issue of human factor in aviation, specifically relating to pilots, types of pilot training, obtaining of pilot licenses in Europe, America and Russia, analysis and comparing of age and health ability and airworthiness of pilots in Europe, America and Russia. Proposals how to improve existing standards regarding to European pilots are also a part of the article.

K e y w o r d s: pilot, error rate of pilots, aircrew training, capability of pilot licenses

1 INTRODUCTION

Individual sections of this article are familiar with the basic terminology and human factors in the aviation.

The article mentions two most commonly used standards for better explanation of the human factor. Some part is paid to error rate of pilots and mental stress which forms part of pilot environment. Later in this article are types and a description of the pilot systems and differences between them. There are a modular pilot system and integrated pilot system. The following part of the article discusses the conditions that must be met to obtain a pilot's license, which are obtainable in Europe, America and Russia. In each of these areas different standards and regulations are use and apply under which the pilot licenses can be issued.

The last section contains the analysis, comparison and suggestions for improving the requirements to obtain a pilot's license in the countries of Europe and proposes a new form called HEALTH PILOT 2014, which includes established requirements for physical capacity necessary to obtain pilot licenses.

2 TERMINOLOGY, HUMAN FACTORS IN AVIATION AND MODELS

Air transport is one of the safest transportation in the world, it's true. But some people do not think so, they have misconceptions. Despite these arguments they think the air transport is very dangerous, if follows that they use another transport in general

I'm not suggesting there are no errors in the aviation, but it's necessary to ensure measures which will facilitate the reduction of these situation. Already when we are talking about errors, mention should be made there are not only errors because of damaged equipment or other aircraft component. There are the most of errors caused by human error. A human is a fallible creature so ther is a high probability of failure.

This can have in aviation very disastrous consequences, which certainly don't need to remember.

As an example of human error, in 1977 was on Canary Islands in Tenerife, the biggest accident in over time, when the airplane flight.

That day was writing in history with a black letters. In this time died over that 583 people, where into

each other on the track meet two Boeing 747's. After investigation, it was found, that the main cause of this accident negligence principles of human factor in man's relationship with technical means. According to: [1]

The main focus is concentrated on the pilots. They are inherently part of an operational aviation. Who is actually a pilot? It's a person who owns a particular pilot's license pilot class, and under this license shall be entitled to operate the flights. We know several types of pilot licenses. For example a pilot's license: pilot - student, private pilot PPL, commercial pilot CPL or pilot license transport ATPL.

The special category of pilots are military pilots.

Pilots who do military activity, are the trained and trained to combat, support operations and non-combat operations. As part of their activities are also included rescue operations. The big difference in terms of transport and military pilots or private pilots is in the fact, that they have an established orders "from office". To their partly different from other pilots in a situation at a moment for the flight are dependent on own. The pilots muss make a best and the safest desicion in ours work.

Conditions under which it's possible to obtain individual licenses are discussed later in this article.

1.1 Models

As mentioned above, a person (human factors) is a very important part in aviation. But in order to at least partially understood a person has created a so-called models. The best-known and most used model is a REASON model and model SHELL. Each of the mentioned models is focused on the problems of the human factor, but each of the other sites. Model SHELL is focused on the body, located in the center of the model, and around it there are influences that affect it and also affected his work. REASON model says that no incident arises if from nowhere, but that it precedes the occurrence of adverse effects and defects of different nature. More illustration of link errors that can have catastrophic nature, in the event that errors rather fail to detect. According to: [2],[3]



Fig. 1 Model SHELL according to: [4]

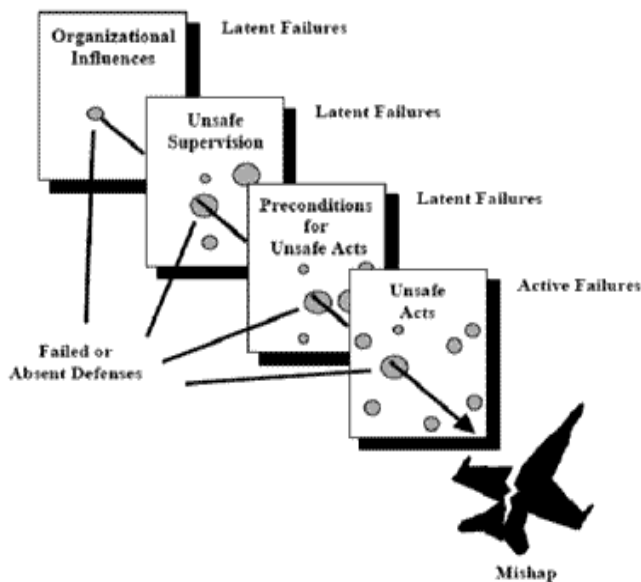


Fig. 2 REASON model

1.2 Error rates and mental workload of pilots

Statistics show that the largest number of errors occur in all phases of take-off and landing aircraft. This are two phases form from the flight, that are minimal period of time, so it's shocking to find that in so short acts, is exactly what happens to the largest number of air accidents. It's therefore important to focus on these areas, with a view to reducing these errors.

1.3 Mental workload pilots

Upon occurrence is frequent guide a psychological stress pilots. This results from their work, which represents activity controlled and manual. The pilot has in the description of their work, several very important acts and activities which require maximum focus and responsibility. According to: [5]

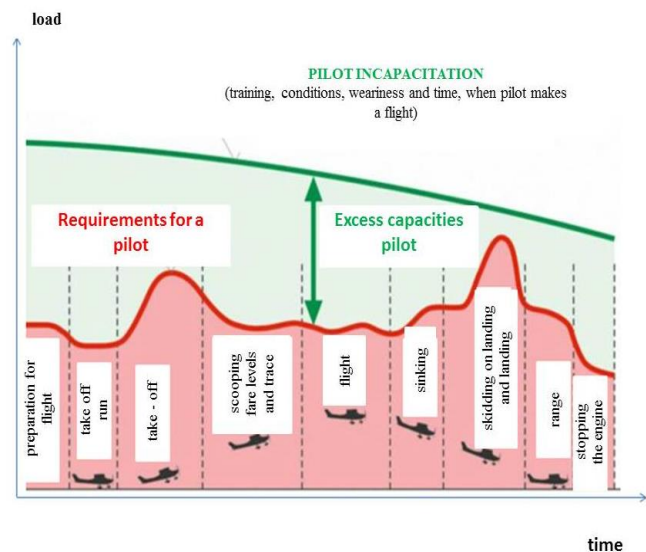


Fig. 3 Pilot incapacitation, depending on the current phase of flight, according to: [4]

1.4 The factors affecting the decision-making pilot

Very important is how the pilot decided, because not all decisions, which are available at higher pressure, are the rescue. But one thing is clear, everything, what pilot do, is better than being indecisive and expect the situation adjusted itself. It all depends on several components, including:

- thinking,
- attention,
- memory,
- motivation,
- internal conflict,
- pilot incapacitation,
- other factors.

2 PILOTS TRAINING

Human errors are the top of all errors in aviation. The statistics show over 80% a human errors in aviation. To ensure the reliability and quality of aircrew and flight personnel only enough quality selection but is primarily an indispensable adequate training and further training of aviation personnel. This training has represents a systematic and thoughtful way of implementing human factors in aviation systems.

In the world exist two types of pilot training - modular and integrated pilot training.

The first requirement for graduation module pilot training is to be already holder of a private pilot license PPL airplanes (at least). According to: [6] Integrated pilot

training is a comprehensive training program. He provides tenderer very quick process from the very beginning until after piloting as co-pilot on transport aircraft. All flight tasks required to gain professional pilot licenses are grouped into one integrated training. Approve specific training flight school Aviation Authority and this training must be completed within a certain time interval. That is also the reason which these aforementioned pilot trainings vary. According to: [7]

3 ACQUISITION PILOT LICENSE IN EUROPE, AMERICA AND RUSSIA, THEIR COMPARISON, ANALYSIS AND DESIGN CHANGES REGARDING THE STANDARDS OF EUROPE

It's not rule, that everywhere are the same conditions and using the same standards, which imply the requirements for obtaining pilot licenses. This implies that other standards and requirements must meet the pilots of Europe, America, and otherwise it will not be in Russia. These standards have some differences and that differences are in the following section of this article.

List of organizations that deal with issues approval requirements aircrew:

- Europe: EASA European Aviation Civil Aviation Authority
- America: JAA - Joint Aviation Authorities
- Russia: SCAA - State Civil Aviation Authority of Russia

For comparison and analysis of the different requirements for pilots, it was necessary to understand the various standards used in mentioned areas. The main area of the analysis was to focus on the pilots' age requirements, medical fitness requirements and airworthiness requirements. For better orientation in this issue, there are tables below with the required capabilities, which were mentioned above. New draft amendments for European pilots are also listed in table with original requirements.

3.1 Age requirements

MINIMUM AGE	EUROPE	AMERICA	RUSSIA
PILOT - STUDENT	(16) 18 <	16 <	not defined
PPL	(17) 18 <	17 <	18 <
CPL	18 <	18 <	18 <
ATPL	21 <	21 <	21 <

Fig. 4 Age eligibility requirements for obtaining pilot licenses, own processing

In the picture is a table with the requirements for the minimum age, before completing training or course for obtaining the type of pilot license already with a new proposal of years. Regarding the type of commercial pilot licenses pilot CPL and ATPL airline pilot, are not listed any changes regarding the increase or reducing the minimum number of years of pilots. As can be seen, these requirements are the same as in America as well as pilots flying in Russia, these requirements set the minimum age of 18 years for commercial pilots and 21 years or more for transport pilots.

To get back to category pilot – student, in this category introduces a change. This change will be included in the rules applicable to the European countries and therefore FCL regulations as Appendix A of Subpart changes flc 0.20. This change doesn't apply to pilots - students balloons, only for pilots flying on airplanes.

The same change is also introduced in the category of private pilot, where European standards specify the minimum age of 17 years. Changed by replacing standard FCL as Appendix C of Subpart changes FLC 200 in America, although it maybe so " old " pilots to obtain a pilot license private pilot, but in Russia the substance is set at 18 years. In Russia it's caused mainly by the absence of a particular category, the pilot – student.

3.2 Medical fitness requirements

MEDICAL FITNESS	EUROPE	AMERICA	RUSSIA
PILOT - STUDENT	1./2. class	3. class	not defined
PPL	1./2. class	3. class	1./2. class
CPL	2. class	2. class	1./2. class
ATPL	1. class	1. class	1. class

Fig. 5 Medical fitness requirements for obtaining pilot licenses, own processing

Changes related to medical fitness of pilots aren't implemented in Europe. As seen from the picture, up to certain categories of pilots, they each area (Europe, America and Russia) introduced different requirements for different types of licenses. Some medical fitness classes contained in the table that has introduced America is entirely in its regulations Europe or even Russia and so the issues are not addressed further due to a lack of resources.

3.3 Airworthiness requirements

AERONAUTICS EXPERIENCE	EUROPE	AMERICA	RUSSIA
PILOT - STUDENT	pilot training english language	test of knowledge english language	not defined in Russia don't have category pilot - student
PPL	> (45) <u>40</u> h. pilot, there of (5) <u>15</u> h. trainer/simulator <u>night flight</u> : 5 h. <u>training</u> : 25 h. instructor: there of 10 h. independently	> 40 h. there of 20 h. trainer/simulator, 10 h. independently <u>night flight</u> : 3 h., 10 take-off and 10 landing with full stop	> 40 h. or 35 h. in course and 5 h. simulator, 1 h. instrument flight <u>night flight</u> : 5 take-off and 5 landing in night
CPL	> (150) <u>250</u> h. there of 100 h. as pilot in command, 20 h. VFR overflights, 10 h. instrument flight <u>night flight</u> : 5 h., 5 take-off and 5 landing with full stop (ak pilot neabsolvoval integrovaný výcvik – 200 h.)	> 250 h. z toho 100 h. s motorovým letadlom, 20 h. výcvik v letu <u>night flight</u> : 5 h., 10 take-off and 10 landing at the airport with control tower	> 200 h. or 150 h. in course, 10 h. simulator, 20 h. cross-country flight, 10 h. instrument flight, there of 5 h. simulator
ATPL	> 1500 h. there of 100 h. simulator, 500 h. as pilot in command, 200 h. cross-country flight, <u>instrument flight</u> : 75 h., <u>night flight</u> : 100 h.	> 1500 h. z toho 500 h. cross-country let, <u>instrument flight</u> : 75 h., <u>night flight</u> : 100 h.	> 1500 h. there of 100 h. simulator, 500 h. as pilot in command (supervised), 200 h. cross-country flight, <u>instrument flight</u> : 75 h.

Fig. 6 Airworthiness requirements for obtaining pilot licenses, own processing

Changes, relating to airworthiness for obtaining the type of pilot's license, will be several. The changes are designed to supplement Subpart C for PPL, CPL for Subpart D and Subpart F for ATPL.

Getting a pilot license PPL in European rules set at a minimum 45 flight hours. In America and in Russia it's for this category set at 40 flight hours. The first change will reduce 45 flight hours on the 40 flight hours, because, as is true " isn't always a good thing , which is a lot", and in theory it comes to 5 hours of flight time, which is considered to be no significant deviation from the other standards. It also states, that during these hours must be flown on pilot flight simulator 15 flight hours, not the original 5 flight hours. A pilot, who has flown 40 hours, can according to the new proposed amendment, get private pilot license PPL.

Other major changes occur in the standards, which prescribe the requirements for obtaining a commercial pilot license CPL. Taking into account the multiple of the number of hours for the category PPL and CPL is shocking that the European rules, the need for the number of hours flown (transition from PPL to CPL) only swelled by almost 3.5 times compared to Russian rules, where the difference is 5 times the number of hours in America even 6.02 times the number of hours. You could say that in America need to have pilots flown almost half more hours to obtain such a license. Even Russian pilots have these requirements slightly larger. The proposal

therefore is to increase the number of hours flown from the original 150 to 250 flight hours.

Requirements relating to the Airline Pilots ATPL, have a very similar nature. The table clearly see that in all three areas are compared to the same standards set the minimum number of flight hours - 1500th Even instrument flight have the same value and the minimum number of 75 flight hours flown instrument. The only difference is in the cross-country flights in Europe where it should be, as in Russia, flown 200 flight hours, and in America it to 500 flight hours. This section doesn't supplement OF ANY changes to the standards.

4. STANDARD "HEALTH PILOT 2014"

Draft standard titled HEALTH PILOT 2014 (HP 2014) on the implementation of mandatory physical tests.

It is a passing physical test and obtain a license HEALTH PILOT 2014. In the above mentioned standards and rules was written mainly about the minimum age requirements for the pilot to achieve medical fitness and the necessary airworthiness. In them there is "gro", which needs to have the pilot to achieve one of the levels of pilot license. But even in a single standard not mentioned ANY physical examinations or tests. This was the main reason for establishing standards titled HEALTH PILOT 2014, which consists of individuals of requirements for pilots category.

The introduction of this proposal, i took it that more and more pilots (does not matter the type pilot license) gets over time to state that his physical activity decreases. And with that linked several limitations. Not all are related to weight, due to the fact we are talking about reducing the activity and are generally expected to increase by weight, respectively. incoming obesity and various types of diseases. The principal would like included, for example decreased comfort in the cockpit. This applies in particular to form pilot's body, but what is more important for this fact is that, the body isn't only physically, but also the mental gradually subsiding, the body is weakened, which may result in slow reflexes or slow response to unexpected events. Same publication "Aeronautics and Space" provides just this fact very negative in today's world is increasingly occurring. Based on all these facts and analyzes, I created a comprehensive standard which consists of passing the physical tests that pilots will have to pass at a time. The exact composition of these physical tests are located in the following part of the article.

4.1 OBTAINING A LICENCE "HEALTH PILOT 2014"

To obtain a license HEALTH PILOT 2014 will have a pilot (by type of pilot's license) meet the following requirements:

PILOT – STUDENT

run: 2500 m/14 min
 sit up: 38/1 min
 cranks: 30/1 min
 long jump from place: 170 cm
 swim: -
 (after the test pilot will be issued license HEALTH PILOT ST 2014)

PRIVATE PILOT PPL

run: 2400 m/14 min
 sit up: 35/1 min
 cranks: 27/1 min
 long jump from place: 170 cm
 swim: 1000m/to complete
 (after the test pilot will be issued license HEALTH PILOT PPL 2014)

COMMERCIAL PILOT CPL

run: 2300 m/14 min
 sit up: 35/1 min
 cranks: 27/1 min
 long jump from place: 170 cm
 swim: 1000m/to complete
 (after the test pilot will be issued license HEALTH PILOT CPL 2014)

AIRLINE PILOT ATPL

run: 2200 m/14 min
 sit up: 30/1 min
 cranks: 20/1 min
 long jump from place: 170 cm
 swim: 1000m/to complete
 (after the test pilot will be issued license HEALTH PILOT ATPL 2014)

Physical tests will be carried out in the respective training centers where they receive follows pilots pilot's licenses once all essentials. Every pilot, who begin training on one of the pilot's license, must by a owner a license HEALTH PILOT 2014. The period of validity of each license HEALTH PILOT 2014 is set at five years, with the condition, where the pilot will already have a license HEALTH PILOT 2014, and within 5 years undergoing training to get another pilot licenses, the validity of the old license expires and must pass the test again under type of pilot license. Otherwise validity

period lasts 5 years. After reaching the airline transport pilot license ATPL is the license HEALTH PILOT 2014 is issued for a period of 10 years.

Licenses will be issued by the competent aviation authority of each country and these licenses will be internationally (in Europe), as applicable. Each license is charged and pilot pays this licences - 15 €. This standard for the introduction of physical tests shall enter into force on the day of 10.10. 2015.

5 CONCLUSION

It's very important make a control about pilot in all area. They represent an important piece of the puzzle, without which it would not be possible to operate air transport. The fact, that the pilot work carried out by a person guaranteed in part by the fact that there may arise an error. It's just one of the many error that may occur and this have a catastrophic end, which we are trying from the very beginning to prevent the operation of air transport. Introduction of standards contributes to the harmonization of rules. It's an important part of the system. When creating ever new and new rules which would generate a short period, would also not practical, and would again raise tensions, which could result in adverse situations. Conversely, if the standard potential, and would contain really necessary particulars, it's necessary to introduce such standards and contributing to the protection of aviation. The new standard "HEALTH PILOT 2014", which will be implemented into already existing standards in 2015, would be a great help to causing an increase in the quality of pilots.

BIBLIOGRAPHY

- [1] POPRENDÁ, Doc. RSDr. Ján. CSc. – ROZENBERG, Ing. Róbert. – ČEKAN, Mgr. Peter. – ČEKANOVÁ, Mgr. Terézia.: *Ludský faktor v leteckej*. Košice: elfa, s.r.o., Košice, 568. publikácia, 2009. 210 s. ISBN 978-80-8086-107-0
- [2] Available at internet: <<http://www.vacc-cz.org/forum/viewtopic.php?id=5291>>
- [3] Available at internet: <<http://www.profiipilot.sk/magazin/nehody/vybrane-faktory-majuce-vplyv-na-bezpecnost-leteckej-prevadzky>>
- [4] Available at internet: <<http://www.skolenipilotu.cz/skoleni-2/>>

- [5] DVOZNÍK, Oliver – KŘÍŽ, Jozef – BLAŠKO, Peter: *Ludská výkonnosť a jej obmedzenia*. Žilina: Žilinská univerzita, 2001. 148 s. ISBN 80-7100-811-7
- [6] Available at internet:
<<http://www.profipilot.sk/letecky-vycvik-vseobecny-opis/modulovy-vycvik-frozen-atpl-a?responsive=0>>
- [7] Available at internet:
<<http://www.profipilot.sk/letecky-vycvik-vseobecny-opis/integrovaný-vycvik-frozen-atpl-a>>

AUTHOR(S)´ ADDRESS(ES)

Technical university of Košice
Faculty of aeronautics
Rampová 7, 041 21 Košice

Bc. Eva Farkašová
ewka.farkasova@gmail.com

Mgr. Peter Čekan, PhD.
peter.cekan@tuke.sk